

REMARKS/ARGUMENTS

Claims 10, 11, 13-18, and 20-27 are pending in the Application. Claims 10, 15, and 23-26 are currently amended. Claims 11, 13-18, 20-22, and 27 were previously presented.

Claims 23, 24, and 26 have been amended to recover the “consists of” language corresponding to the transitional phrase “consisting of” in original Claim 1 and page 3, lines 4-8, so to recite a method of forming an article comprising impregnating and/or coating fibrous and/or granular substrates with a thermally polymerizable mixture and polymerizing the mixture, wherein the thermally polymerizable mixture consists of (1) a multifunctional macromonomer, (2) a radical polymerization initiator, and optionally, (3) at least one additive selected from the group consisting of polymerization inhibitors, solvents, dispersants, emulsifiers, pigments, fillers, curing agents, antimigration agents, plasticizers, biocides, dyes, antioxidants, and waxes. As stated, support for the “consists of” language is found in original Claim 1 and the Specification at page 3, lines 4-8. The Specification also teaches that the thermally polymerizable mixture may optionally contain at least one additive selected from the group consisting of polymerization inhibitors, solvents, dispersants, emulsifiers, pigments, fillers, curing agents, antimigration agents, plasticizers, biocides, dyes, antioxidants, and waxes. Support for the optional additives in the polymerization mixture is found in the Specification at page 5, lines 34-35; page 6, line 37, to page 7, line 2; page 7, lines 4-9; page 7, lines 19-22; and Examples 1-4 on pages 8-9.

Claim 15 is amended to eliminate the extraneous “or” in step “c)”.

Claims 10 and 25 have been amended to specify that the free-radically polymerizable group of the multifunctional macromonomer is an unsaturated group selected from the group consisting of an acrylate group, a methacrylate group, a maleate group, a vinyl ether group, a vinyl group, and an allyl group. Support for the polymerizable unsaturated group is found in

original Claim 9 and the Specification at page 3, lines 10-16; page 3, line 23-35; and page 5, lines 35-36.

Claim 10 has been amended to require “a polymerizable content of at least one free-radically polymerizable unsaturated group” in the multifunctional macromonomer. Support is found in the Specification at page 3, lines 10 to 21; and page 5, lines 33, to page 6, line 2; and in original Claim 1. Claim 10 has also been amended to delete the phrase “wherein the thermally polymerizable mixture does not comprise monomers other than the multifunctional macromonomer” which the Examiner found was not described in the Specification as originally filed.

Finally, the phrases “mixture comprises” in previously presented Claim 10 and “mixture consists essentially of” in previously presented Claim 25 have been deleted and replaced by “impregnating and/or coating fibrous and/or granular substrates with a thermally polymerizable mixture of a multifunctional macromonomer and a radical polymerization initiator” in Claim 10 and “impregnating fibrous and/or granular substrates with a thermally polymerizable mixture of: (1) a multifunctional macromonomer . . . and (2) a radical polymerization initiator” in Claim 25. Express support therefore is found in the Specification at page 1, lines 1-2 and 6-7.

The Federal Circuit instructs in *Mars, Inc. v. H.J. Heinz Co.*, 377 F.3d 1369, 1376 (Fed. Cir. 2004), “[L]ike the term “comprising,” the terms “containing” and “mixture” are open-ended.” Moreover, claim language is to be give its broadest reasonable interpretation consistent with the supporting specification. *In re Zletz*, 893 F.2d 319, 321 (Fed. Cir. 1989). Applicant’s Specification consistently interprets the phrase “thermally polymerizable mixture of . . . a multifunctional macromonomer . . . and a radical polymerization initiator” as open-ended.

Applicant's thermally polymerizable mixture is open to free-radically polymerizable unsaturated monomers other than the multifunctional polymerizable macromonomer and to additives such as polymerization inhibitors, solvents, dispersants, emulsifiers, pigments, fillers, curing agents, antimigration agents, plasticizers, biocides, dyes, antioxidants, and waxes. The amendments to Claims 10 and 25 adding the term unsaturated to define the polymerizable group of the multifunctional polymerizable macromonomer and requiring a polymerizable content of the polymerizable group in the polymerizable mixture should clarify that the thermally polymerizable multifunctional macromonomer in the polymerizable mixture must include a free-radically polymerizable content of at least one unsaturated group selected from the group consisting of an acrylate group, a methacrylate group, a maleate group, a vinyl ether group, a vinyl group, and an allyl group.

No new matter is added.

Rejections of Claims 10-11, 13-18, 20-25 and 27 under 35 U.S.C. 112, 1st ¶

Previously presented Claims 10-11, 13-18, 20-25 and 27 were rejected under 35 U.S.C. 112, 1st ¶, for noncompliance with its written description requirement. Office Action dated July 21, 2009 (OA), page 2. The Examiner argues that Applicant's use of the transitional terms "comprising" and "consisting essentially of" in Claims 10, 23, and 25 to define the content of the "thermally polymerizable mixture" employed in the claimed method and the negative limitation "wherein the thermally polymerizable mixture does not comprise monomers other than the multifunctional macromonomer" in Claim 10 improperly open the thermally polymerizable mixture to materials not contemplated in the Specification as originally filed and expressly exclude components not expressly excluded in the Specification as originally filed (OA, p. 2).

A currently amended, the phrase "wherein the thermally polymerizable mixture does not comprise monomers other than the multifunctional macromonomer" has been deleted

from Claim 10. Moreover, Claims 10 and 25 now both require “impregnating [and/or coating] fibrous and/or granular substrates with a thermally polymerizable mixture of a multifunctional macromonomer and a radical polymerization initiator” which the Federal Circuit interprets and concludes is open-ended. *Mars, Inc. v. H.J. Heinz Co.*, 377 F.3d at 1376. Applicant’s Specification expressly states (Spec., p. 1, ll. 6-7; emphasis added), “This invention relates to thermally polymerizable mixtures of multifunctional macromonomers and polymerization initiators and their use as binders for substrates.”

The Examiner acknowledged specific support for the transitional phrase “consisting of” in the originally filed claims (OA, pp. 2-3, bridging ¶) but also recognized that the Specification also teaches that the thermally polymerizable mixtures may contain inhibitors and other customary additives in customary amounts, e.g., emulsifiers, pigments, fillers, curing agents, antimigration agents, plasticizers, biocides, dyes, antioxidants, and waxes (OA, pp. 2-3, bridging ¶). Accordingly, Applicant’s thermally polymerizable mixtures were at the time this Application was filed and remain open-ended. Support for the optional additives in the polymerization mixture is found in the Specification at page 5, lines 34-35; page 6, line 37, to page 7, line 2; page 7, lines 4-9; page 7, lines 19-22; and Examples 1-4 on pages 8-9.

Because, the Specification expressly describes the thermally polymerizable mixture of a multifunctional macromonomer and a radical polymerization initiator recited in Applicant’s currently amended claims, the Examiner’s rejections under 35 U.S.C. 112, 1st ¶, should be withdrawn.

Rejection of Claims 10-11, 13-14, and 21-24 under 35 U.S.C. 103 over Arkens

Previously presented Claims 10-11, 13-14, and 21-24 were rejected under 35 U.S.C. 103 over Arkens (U.S. 5,661,213, issued August 26, 1997). The rejection should be withdrawn for the following reasons.

Arkens teaches a curable aqueous composition comprising: (a) a polyacid comprising at least two carboxylic acid groups or anhydrides or salts thereof, (b) a polyol comprising at least two hydroxyl groups, and (c) a phosphorous-containing accelerator. The curable composition is used as a binder for nonwoven fibers such as fiberglass (Arkens, col. 2, ll. 55-58).

Arkens' polyacid is a polymeric polyacid. The polymeric polyacid is a "polymer formed from at least one ethylenically unsaturated monomer" (Arkens, col. 3, ll. 57-59). Arkens' polymer has at least two carboxylic acid groups (Arkens, col. 4, ll. 1-2). However, Arkens' polymer does not contain a polymerizable content of polymerizable unsaturated groups. Arkens' polyacid polymers are formed by free-radical polymerizing unsaturated carboxylic acids (Arkens, col. 4, ll. 2-20). Arkens' polyacid polymers are prepared by well-known solution polymerization, emulsion polymerization, or suspension polymerization techniques for polymerizing ethylenically-unsaturated acid monomers such as acrylic acid (Arkens, col. 4, ll. 59-62). Arkens' preferred polyacid is polyacrylic acid. The polyacrylic acid is formed by polymerizing acrylic acid, an unsaturated acid. However, once the unsaturated acrylic acid monomer is polymerized to form polyacrylic acid, the resulting polymer contains an amount of unreacted unsaturated double bonds which is not sufficient for further free-radical polymerization. See Arkens' Examples 1-8, 10-14, and 16-18. Even if persons having ordinary skill in the art reasonably would have expected that polyacid polymers formed by free-radically polymerizing acrylic acid would contain some residual unsaturation, persons having ordinary skill in the art reasonably would not have expected a residual content of unreacted unsaturated groups in the polyacid polymers sufficient for radical polymerization, i.e., would not have expected a polymerizable content of from about 0.1 to 1.0 moles of unreacted polymerizable double bonds per 100g of polymer.

The thermally polymerizable mixtures employed in Applicant's claimed method comprise a multifunctional macromonomer which has a polymerizable content of unsaturated groups. Applicant's polymerizable mixture is polymerized or cured via the thermally polymerizable unsaturated groups. To the contrary, Arkens' polyacid polymers are cured by the reaction of a polyacid with a polyol. Arkens' curing process does not involve polymerizable unsaturated groups at all.

Finally, Arkens does not suggest curable compositions which are not cured by reacting the polyacids with polyols. Arkens would not have suggested to a person having ordinary skill in the art that its polyacid/polyol reactants are curable by free-radical polymerization via polymerizable residual unsaturated groups, especially at the temperatures required for free-radical polymerization of Applicant's multifunctional macromonomers having polymerizable unsaturated groups. See Applicant's currently amended Claim 25.

The Examiner appears to agree that Arkens does not teach contacting a fibrous and/or granular substrate with a polymerizable mixture which consists of a multifunctional macromonomer having a polymerizable content of polymerizable unsaturated groups and polymerizing in the presence of at least one free-radical initiator. The Examiner nevertheless finds that Arkens' polyacids contain enough residual polymerizable unsaturated groups for polymerization, and thus are curable other than by a polyacid/polyol reaction, in the presence of a radical polymerization initiator (OA, pp. 5-6). However, the Examiner has not established that Arkens' polyacids do in fact contain a polymerizable content of thermally polymerizable unsaturated groups which may be thermally polymerized in the presence of a radical polymerization initiator. A conclusion of unpatentability should never be based on speculation. *In re Steele*, 305 F.2d 859, 862 (CCPA 1962).

Nevertheless, the Examiner maintains that it would have been *prima facie* obvious to persons having ordinary skill in the art to impregnate or coat any fibrous or particulate

substrate with any kind of polymerizable mixture and thermally cure that polymerizable mixture by any means recognized in the art (OA, p. 6) in light of Arkens' disclosure, whether or not the polymerizable mixture Arkens discloses is a multifunctional macromonomer which has a polymerizable content of thermally polymerizable unsaturated groups sufficient for free-radical polymerization and/or curing. It is axiomatic that a conclusion of obviousness must be supported by prior art which reasonably suggests the subject matter claimed with a reasonable expectation of success. *In re O'Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988). Arkens' teaching is deficient on both accounts. The Examiner's findings and speculation in support of the rejection under 35 U.S.C. 103 in view of Arken's disclosure are insufficient to sustain the rejection of Applicant's claimed process and should be withdrawn. The Examiner has not satisfied the PTO's initial burden to establish a factual basis for the rejection under 35 U.S.C. 103.

Rejections of Claims 15-18 under 35 U.S.C. 103 over Arkens in view of Rockrath

Claims 15-18 stand rejected under 35 U.S.C. 103 over Arkens in view of Rockrath (U.S. 6,835,420, issued December 28, 2004)(OA, p. 6). The rejection should be withdrawn.

Rockrath does not rectify Arkens' deficiencies. Moreover, as noted previously, the addition of an epoxy compound to Arkens' curable compositions would react with the polyol functional groups in Arkens' compositions and prevent Arkens' compositions from curing. In addition, persons having ordinary skill in the art would not have added free-radical initiators to Arkens' curable composition because neither Arken's polyacids nor its polyols are said to contain a polymerizable content of free-radically polymerizable unsaturated groups.

Rejections of Claims 10-11, 13-14, 17-18, and 20-27 under 35 U.S.C. 103 over Rockrath

Previously presented Claims 10-11, 13-14, 17-18, and 20-27 stand rejected under 35 U.S.C. 103 in view of Rockrath (WO 01/12736, published February 22, 2001). As does the

Examiner, Applicant refers to equivalent U.S.6,835,420, published December 28, 2004, of record. This rejection also should be withdrawn.

Applicant's claims require impregnating and/or coating fibrous and/or granular substrates with a thermally polymerizable mixture and either thermally polymerizing the mixture to bind the fibrous and/or granular substrates (Currently Amended Claim 10) or heating the impregnated substrates to a temperature from 180 to 220°C to polymerize the thermally polymerizable mixture and bind the fibrous and/or granular substrates (Currently Amended Claim 25). Rockrath teaches that its coatings may be cured either by heating or applying actinic radiation with equal success (Rockrath, col. 20, ll. 39-43; col. 21, l. 43, to col. 22, l. 9). Rockrath may cure its coatings either by heating or by applying actinic radiation because its coatings form films having a dry film thickness of from 10 to 100 µm when applied over fiber composites or fiber-reinforced plastics (Rockrath, col. 20, ll. 13-17). Rockrath's coatings are polymerized to form hard, glossy, stratch-resistant finishes (Rockrath, col. 19, ll. 30, to col. 20, l. 17). Rockrath's coatings are formulated for application, and applied, to surfaces formed of fiber composites or fiber-reinforced plastics to produce hard gloss coatings. Rockrath's coating do not penetrate or coat fibrous and/or granular substrates.

To the contrary, the articles formed in accordance with Applicant's claimed process cannot be uniformly polymerized by actinic radiation without additional "costly and inconvenient measures" (Spec., p. 2, ll. 8-13). The reason is that the coatings applied by the methods Applicant claims impregnate and/or coat and bind the fibrous and/or granular substrates and therefore cannot be uniformly polymerized throughout the applied coating thickness by actinic radiation to the full depth of impregnation or thickness of the coating. Rockrath's substrates and applied surface coating are completely different from the substrates and coating applied to the substrates by the method Applicant claims.

The Examiner nevertheless finds that Rockrath's thermally curable coatings comprise an olefinically unsaturated polysiloxane macromonomer and cites Rockrath, col. 7, lines 59-63, in support thereof (OA, p. 14). However, at column 8, lines 6-9, Rockrath teaches (emphasis added):

The binders (A) for inventive use contain at least two, particularly at least three, functional groups (a1) which are able to undergo thermal crosslinking reactions with complementary functional groups (b1) in crosslinking agent (B).

As can be seen from Rockrath's Table at column 8, lines 25-46, there is no suggestion that functional group (a1) and functional group (b1) are double bonds. In fact, the functional groups listed in the table generally do not include any polymerizable double bonds (Rockrath, col. 8, ll. 25-46).

Rockrath teaches (Rockrath, col. 4, ll. 28-31; emphasis added):

[A]t least one binder (A) contains in copolymerized form at least one olefinically unsaturated polysiloxane macromonomer containing on average per molecule at least 3.0 double bonds.

To form binder (A), Rockrath copolymerizes an olefinically unsaturated polysiloxane macromonomer with at least one other unsaturated monomer to form a binder (A) having at least two functional groups. However, Rockrath cures binder (A) by crosslinking its functional groups with the functional groups of an added crosslinking agent. The claimed process of free-radical polymerizing a polymerizable mixture of a multifunctional macromonomer having a polymerizable content of unsaturated groups does not employ a crosslinking agent. Rockrath's process does not resemble the method Applicant claims. Persons having ordinary skill in the art would have understood from Rockrath's disclosure that Rockrath's thermocuring reactions do not involve polymerization of a polymerizable mixture of a multifunctional macromonomer having a polymerizable content of at least one free-radically polymerizable unsaturated group.

That Rockrath's thermocuring reactions do not involve polymerization of unsaturated groups further would have been evident to person having ordinary skill in the art from the low curing temperatures of from 50 to 100°C that Rockrath recommends (Rockrath, col. 21, ll. 32-42). In fact, Rockrath teaches away from those polymerization and/or crosslinking temperatures required for thermal polymerization in accordance with Applicant's claimed process. See Rockrath, col. 21, ll. 32-42.

Finally, Rockrath's curable binder (A) is cured by crosslinking its functional groups with the complementary functional groups of a crosslinking agent whose presence is required in Rockrath's coating material. If Rockrath's binder (A) has a sufficient content of residual unsaturated double bonds and/or other functional groups available for crosslinking, then Rockrath instructs that the thermally curable coating must further contain a crosslinking agent with complementary unsaturated double bonds and/or other functional groups to facilitate curing via crosslinking. Even if persons having ordinary skill in the art would have expected Rockrath's binder (A) to possess a sufficient content of residual double bonds for crosslinking, they would reasonably expect Rockrath to crosslink its thermally polymerizable coatings via other functional groups in binder (A) which are more numerous and available for crosslinking and thermally cure the coatings using a crosslinking agent having complementary functional groups. The content of polymerizable unsaturated functional groups available in Rockrath's binder (A) for crosslinking and effective curing after being polymerized via polymerizable unsaturated groups does not appear to be either adequate or feasible for effective crosslinking and curing.

Rockrath's thermally curable coating materials necessarily include a binding agent (A) and a crosslinking agent (B). See Rockrath's Claim 1. Binding agent (A) must have a sufficient amount of functional groups which complement the functional groups in the crosslinking agent (B) for curing. It serves little purpose to include a crosslinking agent

having functional unsaturated groups in Rockrath's thermally curable coating if the content of residual unsaturated groups in Rockrath's binder (A) is inadequate for crosslinking and insufficient to allow the coating to be thermally cured.

When Applicant's macromonomer is thermally polymerized, it reacts with itself because it has a polymerizable content of at least one free-radically polymerizable unsaturated group. No corresponding reactants with complementary functional groups are required for curing. To the contrary, Rockrath's thermally curable coating can only be cured by crosslinking and includes at least one crosslinking agent in addition to binder (A). Given the polymerization process by which Rockrath's binder (A) is produced, persons having ordinary skill in the art would not have expected Rockrath's binder (A) to contain a polymerizable content of unsaturated groups sufficient for curing. Rockrath expressly states (Rockrath, col. 7, ll. 57-59 emphasis added), "The binders (A) for inventive use may contain the polysiloxane macromonomers in copolymerized form in widely varying amounts." Rockrath's Examples 1-6 at column 24, lines 15-43, show the "Preparation of a Polyacrylate (A)". Rockrath's preparation of Polyacrylate (A) establishes that Rockrath's binder (A) does indeed contain copolymerized polysiloxane macromonomer. Rockrath teaches (Rockrath, col. 24, ll. 25-36; emphasis added):

[A] monomer mixture of 597 g of ethylhexyl acrylate, 173.2 g of hydroxyethyl methacrylate, 128.4 g of styrene, 385.2 g of 4-hydroxybutyl acrylate and 3.2 g of a hexaacrylate-functional polysiloxane macromonomer (methylseloxane resin Tege® LA-S 517 . . .) was metered into the reactor at a uniform rate over the course of 4 hours and an initiator solution . . . was metered into the reactor at a uniform rate over the course of 4.5 hours.

Rockrath used the copolymer produced by free-radical copolymerizing the aforementioned monomeric mixture as its binder (A), i.e., Polyacrylate (A). There is no factual basis in Rockrath for the Examiner finding that Rockrath's binder (A) contains unpolymerized polysiloxane macromonomer having a polymerizable content of free-radically polymerizable unsaturated groups.

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Rockrath does not describe, and reasonably would not have suggested to a person having ordinary skill in the art, the method Applicant currently claims. On review of all the evidence in Rockrath, the Examiner should withdraw the rejections under 35 U.S.C. 103 over Rockrath's teaching.

For the reasons stated, all the Examiner's rejections should be withdrawn. Applicant's currently amended Claims 10-11, 13-18, and 20-27 are in condition for allowance. Early notice of allowance is earnestly requested.

Respectfully submitted,

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